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Test Report for the Trial Burn of Dinoseb in a Pilot-Scale Incinerator

Acurex Corp., Mountain View, CA

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Environmental Protection Agency, Cincinnati, OH

Jun 89

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TEST REPORT FOR THE TRIAL BURN OF DINOSEB IN A PILOT-SCALE INCINERATOR

by

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16. ABSTRACT

The U.S. Environmental Protection Agency (EPA) has determined that the herbicide Dinoseb represents a significant human health hazard. EPA estimates that there are approximately 5 million gallons affected by this action. As part of a program by the EPA Office of Research and Development (ORD) to determine which technically viable disposal option is appropriate, pilot-scale test burns were made of a mixture of Dinoseb products at the John Zink Company Research Incineration Facility in Tulsa, Oklahoma. The mixture represented the various Dinoseb products to be destroyed. The rationale for doing the pilot-scale test was that specific performance data were needed to address, with confidence, any public or permitting questions that may arise in authorizing a full-scale incineration disposal operation.

The test burns were successfully performed between February 18, and February 26, 1988. This report gives an overall summary of the test program.

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FOREWORD

Today's rapidly developing and changing technologies and industrial products and practices frequently carry with them the increased generation of materials that, if improperly dealt with, can threaten both public health and the environment. The U.S. Environmental Protection Agency is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nuture life. These laws direct the EPA to perform research to define our environmental problems, measure the impacts, and search for solutions.

The Risk Reduction Engineering Laboratory is responsible for planning, implementing, and managing research, development, and demonstration programs to provide an authoritative, defensible engineering basis in support of the policies, programs, and regulations of the EPA with respect to drinking water, wastewater, pesticides, toxic substances, solid and hazardous wastes, and Superfund-related activities. This publication is one of the products of that research and provides a vital communication link between the researcher and the user community.

This report summarizes the equipment, procedures, and performance results of a pilot-scale liquid injection incinerator trial burn series conducted on a recently cancelled and indemnified pesticide known as dinoseb. Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), a large inventory (approximately 5,000,000 gallons) of this liquid waste must be safely handled and destroyed in the coming months. Incineration was determined to be the candidate treatment process to be used, and a pilot-scale investigation was necessary to prove the environmental and cost viability of incineration for this previously untested mixture of compounds.

E. Timothy Oppelt, Director
Risk Reduction Engineering Laboratory

ABSTRACT

The U.S. Environmental Protection Agency (EPA) has determined that the herbicide Dinoseb represents a significant human health hazard. EPA estimates that there are approximately 5 million gallons affected by this action. As part of a program by the EPA Office of Research and Development (ORD) to determine which technically viable disposal option is appropriate, pilot-scale test burns were made of a mixture of Dinoseb products at the John Zink Company Research Incineration Facility in Tulsa, Oklahoma. The mixture represented the various Dinoseb products to be destroyed. The rationale for doing the pilot-scale test was that specific performance data were needed to address, with confidence, any public or permitting questions that may arise in authorizing a full-scale incineration disposal operation.

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INTRODUCTION

The U.S. Environmental Protection Agency (EPA) has determined that the herbicide Dinoseb represents a significant human health hazard. The herbicide is currently in the final process of being cancelled and suspended under the Federal Insecticide, Fungicide,and Rodenticide Act (FIFRA). EPA estimates that there are approximately 5 million gallons affected by this action. The herbicide occurs in a variety of formulations in the possession of dealers, users, distributors, etc.

As part of a program by the EPA Office of Research and Development (ORD) to determine which technically viable disposal option is appropriate, the Environmental Systems Division of Acurex Corporation conducted pilot-scale test burns of a mixture of Dinoseb products at the John Zink Company Research Incineration Facility in Tulsa, Oklahoma. The mixture represented the Dinoseb products to be destroyed. The rationale for doing the pilot-scale test was that specific performance data were needed to address, with confidence, any public or permitting questions that may arise in authorizing the full-scale disposal operation.

The sampling and analysis methods were configured to characterize influent and effluent streams and to quantify the incinerator operating conditions. The specific objectives of the test burns were:

- To confirm that destruction and removal efficiency (DRE) of Dinoseb is better than 99.99 percent at typical waste incinerator operating conditions
- To determine the portion of nitrogen in the Dinoseb mixture converted to NO_x in the combustion products
- To determine the particulate emission characteristics of the Dinoseb mixture
- To survey the combustion products for hazardous semivolatile or volatile products of incomplete combustion

Pilot-scale incineration testing was also needed so that interested parties could assess and project basic incineration parameters associated with destroying the Dinoseb products.

The test burn plan was completed in December 1987, and the Quality Assurance Project Plan was approved in February 1988. The test burns were successfully performed between February 18, and February 26, 1988. This report gives an overall summary of the test program.

FACILITY DESCRIPTION

Tests were performed in a conventional liquid injection incinerator at the John Zink Company Research Facility. The system consisted of a horizontal combustion chamber followed by two vertical, water-quenched transfer sections and assorted ducting to downstream pollution control equipment. The schematic, shown as Figure 1, identifies the key components of the incinerator system. The figure includes nominal operating parameters.

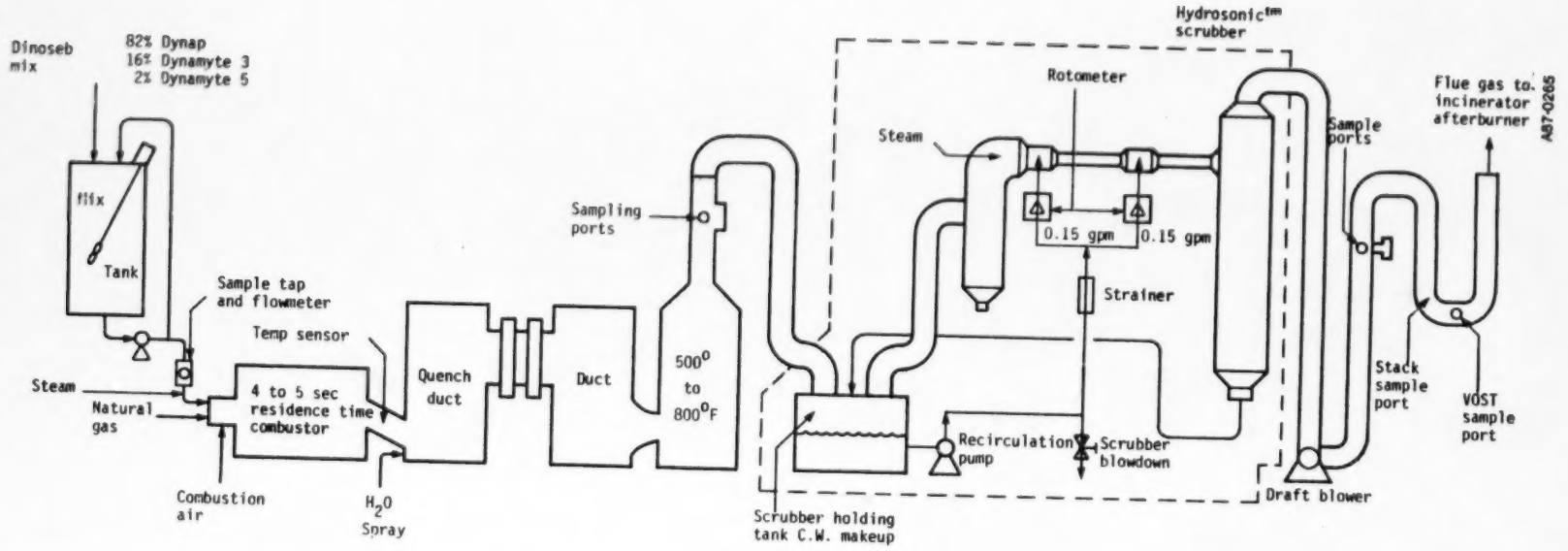

Figure 1. Schematic of the John Zink Co. incinerator and scrubbing system.

FEED MATERIAL CHARACTERISTICS

The nominal Dinoseb mixture fed to the incinerator consisted of 82 percent Dyanap, 16 percent Dynamyte 3, and 1.6 percent Dynamyte 5. The Dyanap, which contains about 12 percent Dinoseb salts, was supplied by Uniroyal Chemical Co. and the Dynamyte 3 and 5, which consist of 51 percent and 54 percent Dinoseb, respectively, came from the Drexel Chemical Co. All of the Dinoseb products were delivered to John Zink's facility in Tulsa, Oklahoma in 30 gallon containers.

According to the manufacturer, Dyanap is a mixture of Dinoseb, Dinoseb salt, a herbicide called Naptalam, other constituents, and water. The common name of Naptalam is sodium alanap or N-1-naphthylphthalemic acid. It represents about 22 percent of the Dyanap. The Dyanap mixture is a dark red liquid, which has a phenolic odor and a specific gravity close to water. However, the Dyanap material tends to become very viscous and solidify below 10°C. The other Dinoseb formulations, Dynamyte 3 and 5 from Drexel, are very stable even at temperatures below 10°C.

For the test burns, the waste mixture was prepared by blending the three Dinoseb products (Dyanap: Dynamyte 3: Dynamyte 5) into an agitated mix tank in a 5:1:0.1 volumetric ratio to produce a waste with a Dinoseb or Dinoseb salt composition of 16 to 20 percent by weight. A sample of this mixture was prepared in the laboratory and kept at ambient temperature of about 20°C. The sample remained homogeneous with no visible signs of immiscibility over a period of more than a month. As long as the mixture is above 20°C, it seems to be easily pumped, agitated, and injected into the incinerator. During testing, ambient temperature was below freezing, so the mixture needed to be heated to remain pumpable.

Table 1 lists the components of the three Dinoseb products used including the approximate component concentrations in weight percent. The table also gives the nominal composition of the feed mixture as computed from the component fractions.

Table 2 gives the results of an analysis for the Dinoseb salt and Naptalam in grab samples taken during testing. Table 3 shows the results of an ultimate analysis of the same samples.

OPERATING CONDITIONS

The primary operating parameters for the test burns were the incinerator exit temperature and the Dinoseb mixture feedrate. Sampling was performed both before (B) and after (A) the particulate scrubber pollution control device at the ports shown in Figure 1. Table 4 summarizes the nominal test matrix and Table 5 gives the operating parameters measured during the testing.

The incinerator was fired primarily on natural gas with relatively small amounts of heating provided by the Dinoseb mixture. Estimated heating value of the mixture is 2,485 cal/gm (4,473 Btu/lb). At one point in the testing, the natural gas was accidentally shut off, and the flame immediately extinguished. In addition, at high Dinoseb flow conditions the flame could not by sustained with the available gas supply.

TABLE 1. NOMINAL COMPOSITION OF FEED MATERIAL

Compound	Uniroyal Dyanap (% by wt)	Drexel Dynamite 3 (% by wt)	Drexel Dynamite 5 (% by wt)	Total (% by wt)
Dinoseb and Dinoseb salts	12	51	54	21.2
Sodium alanap (Naptalam)	22			19.0
Sodium hydroxide	6			5.1
NTA-kelating agent	5			4.5
Isopropyl alcohol	7			5.7
Xylene			33	.6
Diesel oil			4	.1
Methanol		9		1.7
Diethanolamine		8		1.5
Inerts (primarily water)	48	32	9	40.6
Total	100	100	100	100
Fraction in mixture	0.820	0.164	0.016	1.00

TABLE 2. ANALYTICAL EVALUATION OF FEED MATERIAL

Date	Test condition[a]	Dinoseb salt (percent)	Naptalam (percent)	Water (percent)	Specific gravity at 22°C
2/22, 2/23/88	1B	16.3	18.7	57.6	1.13
2/24/88	1A	16.4	17.9	57.4	1.13
2/25/88	2A	16.2	18.2	56.9	1.13
2/26/88	3A	16.3	19.4	57.4	1.13
	Average	16.3	18.6	57.3	1.13

[a]B = Before scrubber sample point; A = After scrubber sample point.

TABLE 3. ULTIMATE ANALYSIS OF FEED MATERIAL

Date	Test Condition	Carbon (% dry)	Hydrogen (% dry)	Nitrogen (% dry)	Ash (% dry)	Oxygen[a] (% dry)
2/22, 2/23/88	1B	27.26	8.65	3.25	6.57	54.27
2/24/88	1A	27.20	8.74	2.82	6.31	54.93
2/25/88	2A	27.33	8.77	3.20	6.75	53.95
2/26/88	3A	26.80	8.96	3.08	6.56	54.58
	Average	27.2	8.8	3.1	6.6	54.3

[a]Oxygen by difference.

TABLE 4. NOMINAL DINOSEB TEST BURN MATRIX

Test Condition	Incinerator Temperature (°C (°F))	Mixture Feedrate (g/min)	Dinoseb and Dinoseb Salt Feedrate[a] (g/min)	Sampling Point
1B	950 (1,750)	250	40	Before scrubber
1A	950 (1,750)	350	57	After scrubber
2A	1,200 (2,200)	350	57	After scrubber
3A	950 (1,750)	1,850	300	After scrubber

[a]Dinoseb and Dionseb salt at 16.3 percent of mixture.

TABLE 5. DINOSEB TEST BURN OPERATING CONDITIONS

Date/ Time	Mixture Feedrate (g/min)	Mixture Heat Release[b] (MMBtu/hr)	Natural Gas Flowrate[c] (SCFH)	Total Heat Release (MMBtu/hr)	Combustion Air Flowrate (SCFM)	Flue Gas O_2 Dry (percent)	Combustion Temperature (°F)	Flue Gas Temperature (°F)
2-22-88/ 1522-1929	262 (116-428)	0.16 (0.07-0.25)	1704 (1848-1560)	1.8 (1.9-1.8)	595 (560-775)	9.0 (8.0-10.0)	1750 (1743-1771)	553 (430-577)
2-23-88/ 1030-1952	292 (160-650)	0.17 (0.09-0.38)	1889 (1602-2448)	2.0 (2.3-1.9)	615 (525-875)	9.9 (8.0-13.8)	1749 (1721-1764)	560 (520-599)
2-24-88/ 1254-0130	372 (151-590)	0.22 (0.09-0.35)	1749 (1971-1602)	1.9 (2.0-1.9)	635 (580-690)	9.5 (6.3-10.2)	1748 (1722-1773)	193 (178-220)
2-25-88/ 1018-1730	340 (340-350)	0.20 (0.20-0.21)	2136 (2300-1971)	2.3 (2.5-2.1)	660 (580-780)	6.6 (4.5-7.8)	2192 (2161-2209)	186 (180-224)
2-26-88/ 0909-1723	1583 (457-2296)	0.94 (0.27-1.36)	1408 (2218-903)	2.3 (2.4-2.2)	695 (690-740)	9.1 (7.8-10.5)	1747 (1734-1761)	197 (180-214)

[a]Average values given, range extremes shown in parenthesis
[b]Based on heat content of 2,485 cal/gm (4,473 Btu/lb)
[c]Assumed natural gas heating value is 11,200 cal/gm (20,160 Btu/lb, 974 Btu/scf)

SAMPLING AND ANALYSIS METHODS

Sampling and analysis were conducted in accordance with an EPA Category II Quality Assurance Project Plan (QAPP). Methods generally followed SW-846, Third Edition, November, 1986. Specific deviations were needed in some cases and are documented in the QAPP.

DINOSEB DESTRUCTION AND REMOVAL EFFICIENCY

The DRE of the Dinoseb mixture in the John Zink incinerator system was evaluated by conducting standard Modified Method 5 (MM5) sampling at the flue gas ducts (Method 0010 of SW-846). Analyses generally followed the protocol, although, during method validation activities, the extraction process was changed to use acetone rather than methylene chloride. In the validation work, Dinoseb recovery exceeding 70 percent was achieved.

No Dinoseb was detected in any of the flue gas samples. The method detection limit (MDL) for the analytical method was 20 µg in the MM5 sample. Table 6 shows the value of DRE that corresponds to the MDL for each run. Dinoseb recovery from spiked samples analyzed with the test samples was 25 percent. Although low, this recovery level proved that if Dinoseb were present, it would have been detected.

NO_x PRODUCTION

As indicated in Table 3, the feed mixture contained 3.1 percent nitrogen. The nitrogen comes from the Dinoseb, Dinoseb salt, Naptalam, and diethanolamine as follows:

Dinoseb	$CH_3(C_2H_5)CHC_6H_2(NO_2)_2\ OH$
Dinoseb salt	$CH_3(C_2H_5)CHC_6H_2(NO_2)_2\ ONa$
Naptalam	$C_{16}\ H_{11}(CO_2)\ NH\ ONa$
Diethanolamine	$(HOCH_2C_2H_2)_2\ NH$

The NO_x concentrations in the flue gas were analyzed continuously using two nondispersive infrared analyzers; one detecting only NO and the second detecting total NO_x. In general, the differences in readings were smaller than the uncertainty in measurement.

Table 7 presents uncorrected NO_x measurements and NO_x values corrected to 7 percent O_2 in the flue gas. For comparison, the table also shows the nitrogen in the feed material, nominal natural gas feedrate, fraction of nitrogen in the fuel, and the resulting overall percent conversion of fuel nitrogen to nitrogen as NO_x. The NO_x conversion values are not corrected for thermal NO_x. For reference, Table 7 includes 3 data points taken when the facility was operating on gas only.

Figure 2 shows the Dinoseb NO_x conversion data overlayed on a plot of fuel nitrogen conversion data from several sources (after Reference 1). For the comparison in Figure 2, the amount of water in the Dinoseb feed was

TABLE 6. DESTRUCTION AND REMOVAL EFFICIENCY OF DINOSEB IN A CONVENTIONAL INCINERATOR

Date Time Condition	Sample location	Incinerator temperature (C (F))	Mixture feedrate (g/min)	Dinoseb feedrate(A) (g/min)	Sample volume (dscm)	Flue gas Dinoseb(B) (ug/dscm)	Flue gas flowrate (dscm/min)	Maximum Dinoseb emission (ug/min)	DRE (percent)
2-22-88 1522-1929 Cond 1B,Run 1	Before scrubber	954 (1750)	262	43	3.9	< 5.1	20.3	< 103.9	>99.9998
2-23-88 1015-1549 Cond 1B,Run 2	Before scrubber	953 (1748)	212	35	3.0	< 6.7	19.1	< 128.4	>99.9996
2-23-88 1125-1654 Cond 1B,Run 3	Before scrubber	953 (1748)	251	41	3.4	< 5.8	19.8	< 115.3	>99.9997
2-24-88 1810-2146 Cond 1A,Run 1	After scrubber	954 (1750)	372	61	3.8	< 5.2	23.9	< 125.0	>99.9998
2-24-88 1810-0130 Cond 1A,Run 2	After scrubber	954 (1750)	372	61	3.1	< 6.4	21.2	< 135.8	>99.9998
2-25-88 1426-1730 Cond 2A,Run 1	After scrubber	1199 (2190)	340	55	2.7	< 7.5	21.0	< 158.2	>99.9997
2-25-88 1426-1626 Cond 2A,Run 2	After scrubber	1199 (2190)	340	55	2.1	< 9.5	18.3	< 174.0	>99.9997
2-26-88 1404-1502 Cond 3A,Run 1	After scrubber	959 (1758)	1839	300	1.1	< 19.0	18.9	< 359.8	>99.9999
2-26-88 1414-1520 Cond 3A,Run 2	After scrubber	959 (1758)	1867	304	1.1	< 17.7	19.3	< 341.8	>99.9999

(A) Fraction of Dinoseb in the feed is 0.163

(B) No Dinoseb was detected in the flue gas samples; flue gas concentration is based on a minimum detection level of 20 ug.

TABLE 7. FUEL NITROGEN CONVERSION TO NO_x

Date/ Time	Sampling Location	Incinerator Temperature (C(F))	Mix feed rate(A) (g/min)	Gas Feedrate (g/min)	Fuel Nitrogen Feedrate (g/min)	Nitrogen in Fuel(A) (wt. %)	Actual NOx (ppm)	NOx at 7% O2 (ppm)	Nitrogen Conversion (percent)
2-09-88 1200-1205	Before scrubber	1206 (2204)	0	952	0	0	170	150	
2-22-88 1349-1354	Before scrubber	979 (1795)	0	841	0	0	95	92	
2-22-88 1522-1929	Before scrubber	954 (1750)	170	691	5.27	0.61	330	361	79
2-23-88 1715-1830	Before scrubber	953 (1748)	280	635	8.68	0.95	214	276	29
2-23-88 1830-2000	Before scrubber	953 (1748)	223	635	6.91	0.81	204	276	37
2-24-88 1230-1430	Before scrubber	954 (1750)	221	651	6.85	0.79	328	453	71
2-24-88 1700-2030	After scrubber	954 (1750)	233	651	7.22	0.82	318	417	58
2-24-88 2030-2500	After scrubber	954 (1750)	241	651	7.47	0.84	342	451	61
2-25-88 1445-1555	After scrubber	1199 (2190)	271	857	8.40	0.74	312	307	49
2-25-88 1605-1655	After scrubber	1199 (2190)	271	857	8.40	0.74	286	274	39
2-26-88 1030-1130	After scrubber	954 (1750)	0	794	0	0	84	112	
2-26-88 1240-1400	Before scrubber	959 (1758)	907	516	28.12	1.98	770	1011	32
2-26-88 1410-1600	After scrubber	959 (1758)	1156	516	35.84	2.14	676	836	23
2-26-88 1600-1720	After scrubber	959 (1758)	1227	516	38.04	2.18	663	834	21

(A) Mixture feedrate on a dry basis; 57.3 percent moisture removed.

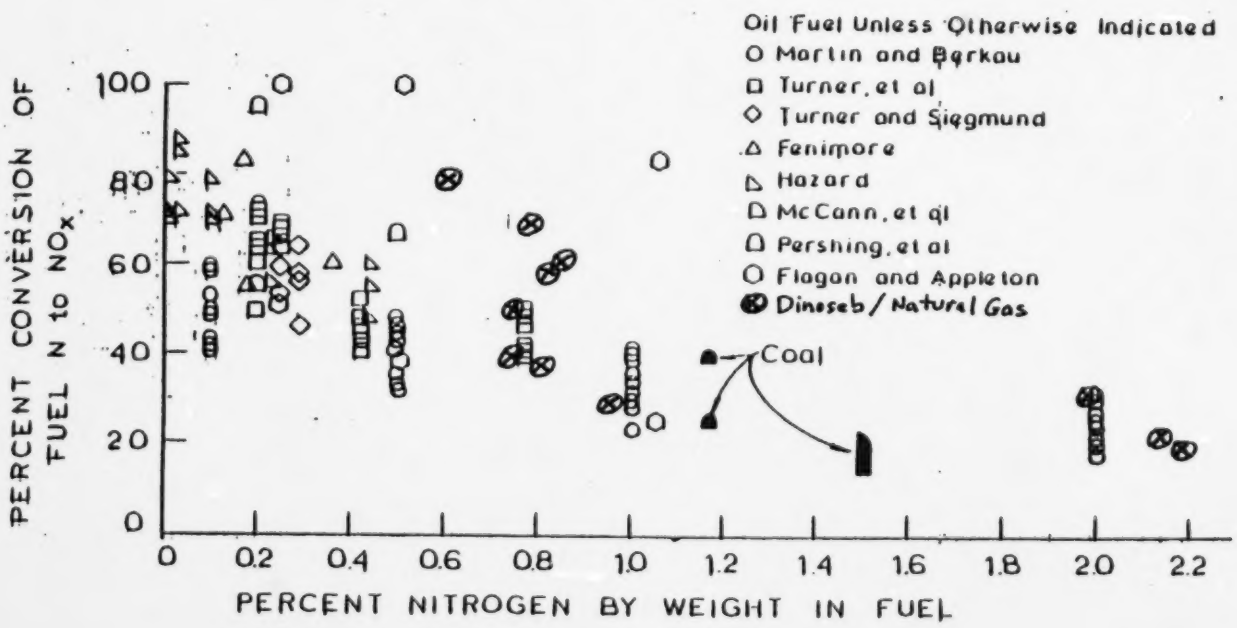

Figure 2. Percent conversion of fuel N to NO_x in laboratory scale combustors, including data from Dinoseb test burn (after Reference 1).

ignored when calculating the percent nitrogen in the fuel. That is, percent nitrogen equals nitrogen divided by mixture feedrate less the water in the feed plus natural gas feedrate.

A second useful comparison is shown in Figure 3. In Figure 3, the mass of NO_x (as NO_2 per MMBtu) from each test point is overlayed on a historical compilation of NO_x emission data. One could conclude that the Dinoseb incineration behavior was similar to that of a typical nitrogen-containing fossil fuel.

PARTICULATE RESULTS

The mass rate of particulate in the flue gas was measured using a standard Method 5 isokinetic sampling protocol. Generally, these samples were concurrent with the MM5 samples for Dinoseb DRE measurements. Table 8 gives the test results, including a breakdown by location in the sampling train where particles were found. The table also includes two data points taken upstream of the scrubber during runs on February 18 (natural gas only) and February 19. The Method 5 run on February 18 showed that no measurable amount of material from any previous test program was entrained in the combustion products. Particulate rates for the Dinoseb burns were comparable to the natural gas test result until late in the second day of DRE testing, i.e. February 23, 1988. At this time, the particulate rate increased dramatically, indicating possibly that particulate had been accumulating in the incinerator or quench ducts. The February 23 test point is 0.76 kg/hr particulate emission rate. For comparison, the calculated maximum ash flowrate, based on the post test ultimate analysis of the feed, is 1.04 kg/hr at the February 23 test condition.

The remaining test points were taken downstream of the facility's scrubber. Under the assumption that all ash in the feed was flowing to the scrubber during the test days when samples were taken downstream of the scrubber, the results indicate that the scrubber was better than 99 percent effective in removing the particulate mass.

The particulate varied in size, at times plugging filters and at other times passing through the filter to the backhalf of the sampling train. The particulate was white and generally fine. A particulate sample was analyzed to determine composition. The ratio of sodium to calcium was 6.8:1.

PRODUCTS OF INCOMPLETE COMBUSTION

The MM5 sample extract was analyzed by EPA Method 8270 to identify priority pollutants and other semivolatile organics in the combustion products from the Dinoseb test burns. Table 9 gives the concentrations of the identified compounds.

In addition, VOST samples were taken and analyzed by EPA Method 5040 to provide similar information for the volatile organics in the combustion products. These results are given in Table 10.

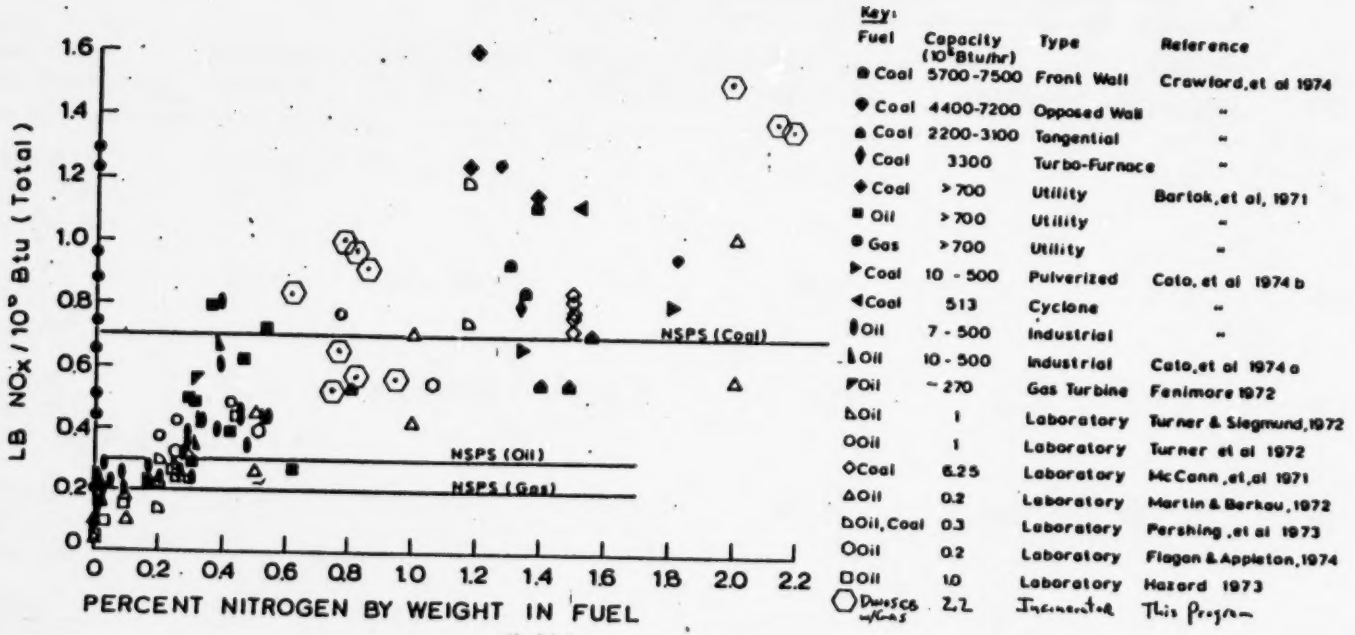
LB NOx / 10⁶ Btu (Total)
PERCENT NITROGEN BY WEIGHT IN FUEL
NSPS (Coal)
NSPS (Oil)
NSPS (Gas)
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
Key:
Fuel | Capacity (10⁶Btu/hr) | Type | Reference
Coal | 5700-7500 | Front Wall | Crawford, et al 1974
Coal | 4400-7200 | Opposed Wall | "
Coal | 2200-3100 | Tangential | "
Coal | 3300 | Turbo-Furnace | "
Coal | >700 | Utility | Bartok, et al, 1971
Oil | >700 | Utility | "
Gas | >700 | Utility | "
Coal | 10 - 500 | Pulverized | Cato, et al 1974 b
Coal | 513 | Cyclone | "
Oil | 7 - 500 | Industrial | "
Oil | 10 - 500 | Industrial | Cato, et al 1974 a
Oil | ~270 | Gas Turbine | Fenimore 1972
Oil | 1 | Laboratory | Turner & Siegmund, 1972
Oil | 1 | Laboratory | Turner et al 1972
Coal | 6.25 | Laboratory | McCann, et al 1971
Oil | 0.2 | Laboratory | Martin & Berkau, 1972
Oil, Coal | 0.3 | Laboratory | Pershing, et al 1973
Oil | 0.2 | Laboratory | Flagan & Appleton, 1974
Oil | 1.0 | Laboratory | Hazard 1973
Dinoseb | 2.2 | Incinerator | This Program

Figure 3. NO_x emissions from uncontrolled combustors as a function of fuel nitrogen content including dinoseb test results.

TABLE 8. FLUE GAS PARTICULATE DATA

Date time condition	Feedrate (lb/hr)	Temperature (°C (°F))	Particulate concentration in sample gas				Total emission (kg/hr)
			Probe rinse (mg/dscm)	Filter paper (mg/dscm)	Backhalf (mg/dscm)	Total (mg/dscm)	
2/18/88 1350-1450 Natural gas[a]	Natural gas	954(1,750)	0	23.9	0	23.9	0.035
2/19/88 1500-1600 Scoping[a]	47.0	954(1,750)	7.8	26.7	0	34.5	0.043
2/22/88 1522-1849 Cond. 1B, Run 1	31.3	958(1,757)	31.0	0.04	0.7	31.8	0.042
2/23/88 1743-1952 Cond. 1B, Run 2	54.8	953(1,748)	35.4	651.9	0	687.3	0.763
2/26/88 0909-1013 Cond. 1A	48.0	953(1,747)	0	5.8	0	5.8	0.008
2/25/88 1018-1124 Cond. 2A	45.7	1,199(2,190)	0	4.7	1.5	6.3	0.007
2/26/88 1620-1723 Cond. 3A	275.5	959(1,758)	0	15.0	2.8	17.8	0.023

[a]Sampling location upstream of scrubber.

TABLE 9. IDENTIFIED SEMIVOLATILE PRIORITY POLLUTANTS AND OTHER ORGANIC COMPOUNDS

Compounds	Condition, run (µg/dscm)								
	1B,1	1B,2	1B,3	1A,1	1A,2	2A,1	2A,2	3A,1	3A,2
Method 8270 compounds									
Phenol	23			3					
2-Nitrophenol			6						
Napthalene								6	
Dimethyl phthalate				3	5	7	12		
Diethyl phthalate				94					
N-Nitrosodiphenylamine								14	
Bis(2-ethylhexyl)phthalate	10		32	102	199	49	44	733	1,770
Di-n-octyl phthalate						5			
Other compounds									
Naptalam*									
4-Methyl phenol							11		
Benzoic acid			5			23			
Substituted benzene			8						
Phenol, (dimethylethyl)					6				
Aliphatic hydrocarbons§			60	209	49		114		

*Detected amounts were less than field and method blank values.
§Also detected in field blank.

TABLE 10. IDENTIFIED VOLATILE PRIORITY POLLUTANTS AND OTHER ORGANIC COMPOUNDS

Compounds	Condition, run (ng/dscm)							
	1B,1	1B,2	1A,1	1A,2	2A,1	2A,2	3A,1	3A,2
Method 5040 compounds								
2-Butanone	10	67	25	123	85	524	1,618	214
Chloroform	15	33	19	42	93	157	273	136
Benzene	800	467	24	26	44	52	66	73
Trichloroethane	4				3	13	5	15
4-Methyl-2-Pentane			5	6	6	10		13
Toluene	17	19	29	71	28	31	36	55
Chlorobenzene	6	4						4
Ethylbenzene	2		3	8	6	9	12	12
m&p-Xylene	6	5	11	35	17	24	34	33
o-Xylene	3	3	6	15	9	13	19	18
Styrene			2	5				
1-4-Dichlorobenzene			11	18	9	11	9	

CONCLUSIONS

The primary conclusions from the test burn of the Dinoseb products subject to destruction by the EPA are as follows:

- Incineration is an effective means of destruction at the conditions tested. DRE values exceeded 99.999 percent at both the 954°C (1750°F) and the 1200°C (2200°F) operating conditions.
- The production of NO_x in the incineration process followed trends exhibited by the combustion of oils and other substances which contain similar amounts of chemically bound nitrogen.
- Measured levels of NO and total NO_x agreed within instrument measurement capabilities, suggesting that levels of NO_2 were not more than five percent of total NO_x levels.
- Particulate mass prior to scrubbing was consistent with ash amounts expected from feed material ultimate analysis. The scrubber at the facility removed better than 99 percent of these fine, white particles. These particles contained sodium, as expected.
- The Dinoseb mixture, which was over 50 percent water, was not able to sustain its own flame in the configuration tested. Natural gas auxiliary firing was needed to sustain the desired combustion temperatures.
- The formation of products of incomplete combustion is consistent with the firing of hydrocarbon fuels with natural gas.

REFERENCE

1. "Air Quality and Stationary Source Emission Control, Part Three: Control of Nitrogen Oxide from Stationary Sources, Chapter 15, Nitrogen Oxide Control Techniques", a report prepared for the Committee on Public Works, United States Senate, Serial No. 94-4, Approved August 2, 1975.